QUALITY ASSURANCE PROJECT PLAN

STERLING HOMES SITE
WEST HILLS, CALIFORNIA

Project No. 05-8520EI

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1.1 INTRODUCTION

1. This Quality Assurance Project Plan (QAPP) has been prepared for the Centex Homes Dayton Canyon site to support Preliminary Endangerment Assessment (PEA) and Site Characterization activities. This QAPP outlines procedures to be used to assure that field investigation activities described in the Workplan to provide accurate and representative data.

2. Modifications to this QAPP may be required whenever the Workplan is modified. The primary procedure for making a modification to the Workplan will be through the use of a Technical Memorandum (TM). In the event a modification is required, a TM will be submitted describing the proposed modification and the associated rational.

3. The remainder of this chapter describes briefly the site background and field activities, while the remainder of the document is organized in the following sections:

- 2.0 –Data Processing
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1.2 SITE BACKGROUND

1. The following relevant site history has been taken from various reports and studies conducted in and around the Centex Dayton Canyon site.

1.2.1 Dayton Canyon Site History

The Centex Homes "Sterling Residential Neighborhood" site is located in West Hills, California, just west of the intersection of Roscoe Blvd. and Valley Circle Blvd. The Sterling Residential Neighborhood property is in an undeveloped area, which has no history of perchlorate usage, storage or releases. The western boundary of the proposed Sterling Homes site is located about 0.5 miles directly east of the approximate eastern boundary of the Rocketdyne facility test site known as the

Santa Susana Field Laboratory (SSFL) in Ventura County, California, as shown in Figure 1.

1.2.2 Rocketdyne Site History

The Rocketdyne facility is located in the Santa Susana Region of Ventura County, California. Operational activities at the SSFL began in 1948 and have primarily included research, development, and testing of liquid-propellant rocket engines and associated components (pumps, valves, etc.). Liquid-propellant rocket engine testing activities have been conducted at six major rocket engine test areas. These areas were in operation simultaneously in the late 1950s and early 1960s. In addition to the primary facility operation for testing liquid-propelled rocket engines, the SSFL was used for nuclear energy research and development, and testing of water jet pumps and lasers.

Petroleum fuel hydrocarbons and chlorinated solvents have been used at the SSFL in large volumes. Petroleum hydrocarbons were used as fuel for many of the liquid-propellant rocket engine tests performed there. Chlorinated solvents, primarily TCE, were used following engine tests to clean elements of the rocket engines and for other equipment degreasing operations at the SSFL. Solid propellants, including perchlorate compounds, were used at the SSFL for research and testing operations. Perchlorate was used in relatively small quantities as an oxidizer for the production of turbine spinners and igniters; for research, development, and production of flares; and for small-scale solid-propellant rocket motors research, development, and testing.

The Rocketdyne facility was used, as indicated above by the Department of Energy for Nuclear testing in its Area IV facilities contained in the western most portions of the site, approximately 3.5 miles from the Sterling Site. The Agency for Toxic Substances and Disease Registry (ATSDR) has previously investigated the offsite areas east and down gradient (Bell Canyon) from Area IV. No significant levels of radionuclides were found in these areas. Due to the topography between Area IV and the Sterling site, and lack of detection of nuclear related hazards on the eastern portions of the Rocketdyne Facility, limited nuclear related hazards were tested for as part of this investigation.

Residual perchlorate concentrations from rocket testing at the Rocketdyne facility have been identified in the area of the former laboratory and test range in the eastern region, referred to as Area I, which is more than a mile from the Sterling site. The Rocketdyne facility has been the subject of various environmental investigations and remediation activities. The Perchlorate levels detected in this region of the Rocketdyne facility were generally below 6 g/kg (ppb), as indicated in the USEPA Resource Conservation and Recovery Act (RCRA) Facility Investigation Program Report, MWH, July 2004.

1.2.3 Site Characteristics

The Sterling site is located east of a dormant portion of the Rocketdyne facility, on the east side of a hill south of the Happy Valley Drainage Area, as shown in Figure 2. Previous studies of this area and local groundwater resources have not shown significant levels of perchlorate or trichloroethylene, another commonly used chemical at the Rocketdyne site. Runoff in Dayton Canyon has been sampled by DTSC and the State Water Resources Control Board (SWRCB). The routine monitoring of surface run-off from these areas tested at SWRCB outfalls HV-1 (NPDES Permit outfall 008) and HV-2 during storm events have not detected significant levels of perchlorate as recent as March, 2005.

The Sterling site ranges in elevation from approximately 900 to 1200 feet amsl. The area is approximately 28 miles northwest of downtown Los Angeles, California, and is located in Los Angeles County. The site climate is typical of Southern California. The site is adjacent to Dayton Creek which drains from the Happy Valley area flowing eastward through the proposed development site.

1.2.4 Local Groundwater

Local ground water in the area of the Sterling Site is at a depth of approximately 60 feet or more, and is not used for drinking water or irrigation.

1.3 FIELD ACTIVITIES DESCRIPTION

The primary field activities will be the collection of shallow soil and sediment samples for analysis for perchlorate and other potential site contaminants. In addition to the soil sampling activities, a radiological survey and associated quality control sampling will be completed. The purpose of the field sampling activities will be to collect sufficient data to complete a Preliminary Endangerment Assessment for the future areas to be developed, and additional data on the lower creek area, to determine the final remedial action. Since the Centex Dayton Canyon Site is very large, approximately 65 acres, the work plan has been divided up into various sub-areas, based on the topography of the site. The sub-areas as shown in Figure 7, are as follows:

1. Dayton Canyon North; this area is north of the creek adjacent to Valley Circle.
2. Dayton Canyon South; this area is south of the creek.
3. Dayton Canyon West; this area is west of the Dayton Canyon North and South area. The area is divided from the south area by a ridge line, as shown in Figure 7.

2.0 DATA PROCESSING

1. This section: (1) provides the approach taken by the project team to meet regulatory and client requirements; (2) provides for organizational structure,

functional responsibilities, levels of authority, and lines of communication; describes requirements for the training of personnel responsible for performance of work activities affecting quality.

2.1 ORGANIZATION AND RESPONSIBILITIES

1. The organization structure, functional responsibilities, levels of authority and lines of communication for project departments that perform activities affecting quality have been established and documented as follows:

2. **Project Coordinator:** John Fitzpatrick of Centex Homes will be the Project Coordinator.

3. **Project Manager:** Report to the Project Coordinator. Richard Scott of Allwest Remediation, Inc. will be the Project Manager. Oversee the management and implementation of the total project, including project scope, contracts, budgets, schedules, study activity, and the quality of those deliverables. Assure all activities are conducted in accordance with project policy and procedures. Responsible for information and data support for design.

4. **Quality Assurance/Quality Control (QA/QC) Manager:** Reports directly to the Project Manger. Ivan De Leon of Allwest Remediation, Inc. will be the QA/QC Manager. Provides oversight of all field and laboratory activities to verify that to verify that procedures are conducted in accordance with the RD Workplan, SAP, QAPP and regulatory requirements. Responsible for the QAPP and all matters relating to the QA/QC needs of the study. Conducts audits to ensure that work activities comply with the Workplan, this QAPP, and that data quality objectives are met.

5. **Site Safety Officer:** Responsible for Site Health and Safety Plan (HSP) and establishes requirements for protecting the health and safety of the public and project personnel during activities onsite. The Project Manager will be set as the Site Safety Officer.

6. **Laboratory:** Reports directly to the QA/QC Manager. The laboratory will be state-certified, provide Contract Laboratory Program (CLP) Level Quality Assurance Documentation, and will be responsible for the implementation of the QAPP and achieving the data quality objectives for analytical work.

7. **Field Personnel:** Reports directly to the Project Manager. Responsible for performing the field tasks designated in the Workplan and QAPP.

8. The organizational structure and the responsibly assignments are such that: (1) quality is achieved and maintained by those who have been assigned responsibility for performing work; and (2) quality achievement is audited and verified by persons and organizations not directly responsible for performing the work. The organizational responsibilities reflect an integration of the technical, administrative,

9. and QA/QC functions such that the QA program elements are disseminated throughout the entire organizational structure and are an integral part of day-to-day operations. In situations where organizations such as subcontractors, suppliers, consultants, and laboratories are involved in the execution of activities governed by the requirements of this QAPP, the responsibility and authority of such organizations shall be clearly established and documented.

2.2 INDOCTRINATION AND TRAINING

1. Field staff and office personnel performing QC activities shall be indoctrinated on the following:

- General criteria of the project including codes, standards and other applicable technical procedures.
- Centex Dayton Canyon Workplans.
- Individual job responsibilities and authority as outlined in the SAP.

3.0 QUALITY ASSURANCE OBJECTIVES

1. This section provides requirements for the development of data quality objectives (DQOs) and data quality requirements (DQRs) for the task. The objectives of data management in terms of the quality of data required to implement the study are defined. The scope, level of detail, and verification may very form task to task depending of specific conditions, and based on the nature and complexity of study activities. QA objectives are described in the form of DQOs for the field activities and described in the form of DQRs imposed on laboratory activities. DQOs are the full set of constraints needed to design the sampling and analysis program. DQOs have been prepared in the planning stage of the field work and are designed to ensure that study provides data needed for appropriate decisions made with acceptable confidence.

3.1 DATA QUALITY OBJECTIVES

1. The DQO development process is an interactive process integrated with project planning and is intended to provide a systematic approach evaluating risks associated with making a wrong decision for determining levels of uncertainty associated with these decisions. Data quality needs to begin with the identification of data uses and types, and include appropriate analytical levels. Physical testing laboratories will be required to use American Society of Testing and Materials (ASTM) methods, but are not required to be certified. These analytical levels are defined as:

- **Level I:** Field screening or analyses using portable instruments which provide results in real-time. Results may not be compound-specific or quantitative.

- **Level II:** Field analyses are provided using more sophisticated portable analytical instruments in real-time or several hours. There is a wide range in the quality of data that can be generated depending upon calibration standards, reference materials, sample preparation equipment and operator training.
- **Level III:** Chemical analyses are generally performed in an offsite analytical laboratory. Level III analyses may not use EPA CLP procedures, but usually do not utilize the validation documentation procedures required of CLP level IV analyses.
- **Level IV:** All analyses are preformed in an offsite CLP laboratory following vigorous QA/QC protocols and documentation.
- **Level V:** All analyses are preformed in an offsite CLP or equivalent laboratory. Method development of modification may be required for specific constituents or detection limits.

2. DQOs employ three stages:

- **Stage 1** is the identification of data requirements, and the development of decision types that will be made during the study process.
- **Stage 2** includes determining data needs and uses, establishing criteria for decisions, and identifying and selecting analytical sampling options.
- **Stage 3** requires assembling the sampling and analytical components into an overall sampling design.

3.2 DATA QUALITY REQUIREMENTS

1. DQRs have been established for the environmental data. DQRs are equivalent and quantitative statements that specify characteristics of the required to support decisions during study activities. DQRs identify specific goals for the study data. A summary of the traditional indicators of data quality parameters (precision, accuracy, representativeness, completeness, and comparability [PARCC] is presented as follows:

- **Precision** is the measure of the repeatability of measurements. Precision is measured by the agreement between laboratory and field duplicates and replicate samples. The measure of precision is measured by the relative percent difference (RPD) between two values given by the difference of the two values divided by the mean of the two values expressed in percentage. Typically, relative percent difference agreement of 20 percent or less between aqueous laboratory duplicates and 35 percent for soils is considered to be acceptable. Criteria between field duplicates has not been established, but would be expected to be higher than that of laboratory duplicates. Field duplicates will be evaluated to further understand the heterogeneity of the site soils and to provide another indicator of precision.

- **Accuracy** is the representation of the closeness of a measurement to its true value. The accuracy of a measurement is judged by the comparison of matrix

- spikes and surrogate analyses to their true values. These comparisons are expressed in terms of percent recovery. Generally, for metals analyses, percent recoveries ranging from 75 to 125 percent are considerable acceptable. The acceptance ranges for organics are generally wider and are specific of each analyst and each method as defined in the CLP Statement of Work (SOW).

- **Representativeness** expresses the degree to which sample data accurately and precisely represents the population being sampled. Representativeness is a qualitative parameter and is best achieved by careful design and implementation of the SAP. For this sampling effort, representativeness has been described by the sampling techniques chosen and the rational used to select sampling locations.

- **Completeness** is the measure of how much valid data was obtained from the sampling program compared to the total amount of data collected. Data is considered invalid if certain QC criteria for the analysis program are not achieved. Typically, achieving an 90 percent valid data level when compared with the total amount of data collected is considered acceptable.

- **Comparability** is the measure of how well the data collected under this particular sampling program agrees with past collected data. Comparability is measured by the examination of past data with present data, accounting for any expected or found tends in the data. All data will be required to be reported in standard units, therefore comparability will be measured.

3. For the PEA, a DQO of Level III has been established for chemical-specific analytical analyses. Section 9.1 of the QAPP describes the DQOs for sampling and analytical tasks which may be performed during the RD activities in terms of precision, accuracy and completeness. Analyte-specific QC requirements are also provided in section 9.1. By using EPA and ASTM approved and sampling procedures, representativeness will be assured.

4. Analytical results will be reviewed to determine if the percentage of acceptable data is adequate for project needs. This determination will be made by reviewing laboratory QA reports, considering details of the particular sampling (e.g., location purpose and parameters), and following data management protocols.

4.0 SAMPLING PROCEDURES

1. Sampling objectives, location and frequency, designations, equipment and procedures, and handling and analysis are addressed in the Final SAP or RD Workplan and will be in the future through the TM process.

4.1 SAMPLE COLLECTION

1. Sampling procedures will be conducted in a manner which assures that samples are representative of the media sampled and that the resultant data can be compared to subsequent data sets. The location and number of samples to be collected will be in accordance with the task-specific workplans and will be adequate to permit statistical treatment of the data generated.

4.2 SAMPLE DESIGNATION

1. Field sampling personnel are responsible for describing, documenting, labeling, packaging, storing, handling, and shipping samples obtained in the field so that all samples can be readily identified. These practices are necessary to ensure the integrity of the sample from collection to data reporting.

4.2.1 Sample Labels

1. Sample labels and identity are of critical importance in the collection of samples. All information provided for a sample is keyed to its unique sample designation. This designation, shown on all sample containers and associated field data forms, is used for data recall from the database system.

2. Field personnel will attach a label to each sample container either before or immediately after filing each container. IT is the responsibility of the field sample team leader to maintain a supply of sample labels at the site. The sample label must contain all of the following:

   - The project name and number.
   - A unique sample designation
   - The date and time sample was collected.
   - Designation of the sample as a composite, if appropriate.
   - Identification of preservatives used.
   - Any remarks as needed.
   - Sampler's name or initials.

3. The sample labels will be placed on the sample containers so not to obscure any QA/QC data on the containers such as bottle-lot code numbers. Samples information must be printed in a legible manner using indelible ink. The label must contain sufficient information so that the sample can be identified on the sample information form or collection log.

4. All QC samples, including collocated or duplicate samples and sample blanks, shall be identified using the same information as that used for regular sample identification, but in a manner that does not readily identify those QC samples. This information will be recorded in the sample collection log.

4.2.2 Sample Identification

1. To ensure correct identification of the sample collected, a unique alphanumeric code will be assigned to each sample, as follows:

   - Letter codes will identify the sample type. Example include:

     SE -Sediment sample
     S -Soil sample
     SS -Surface soil sample
     MW -Monitoring well sample
     SW -Surface water sample
     RS -Radiological sample

   - The sample code shall be followed by a unique location number, as appropriate.

4.2.3. Quality Assurance/Quality Control Sample Type And Number

1. Field QC check samples may include field rinsate, field blank, trip blank, and duplicate (collocated) samples. These will be identified in the same manner as described above.

4.3 SAMPLE PRESERVATIVES, CONTAINERIZATION AND HOLDING TIMES

1. Samples for chemical analyses will be containerized and preserved in accordance with procedures listed in Table 4.1. For each parameter, the required type of container, sample volume, sample temperature, type and concentration of preservative, and allowable holding times have been determined. All samples will be placed in individual pre-cleaned for shipment to the laboratory. The required sample preservative, container and holding time for each of the various samples are shown in Table 4.1. The sample containers will be obtained from the laboratory designated to perform the analyses. Sample containers will be inspected randomly for the presence of visible contaminants by the field sample before use. Sample containers with visible contaminants or sample shipment sample containers with visible damage or dirt will be rejected. If there is any doubt as to whether or not a sample container has been thoroughly cleaned, the container will not be used.

2. Solid samples collected for chemical analyses will be packaged, labeled and placed in coolers as soon as possible after collection. Solid samples submitted for physical properties analyses will not be cooled or preserved, but will be sealed in airtight plastic jars or bags for shipping to the laboratory.

3. Sample holding times stated in Table 4.1 must be met unless otherwise specified in the analytical method. The samples will be shipping to the laboratory by overnight courier to minimize the time between collection and processing.

4.4 SAMPLE PACKAGING AND SHIPPING

1. The procedures listed below are concerned with the proper packaging and shipment of samples to minimize the potential for sample breakage, leakage and cross contamination and to provide a clear record of sample custody form collection to analysis. The EPA Resource Conservation Recovery Act (RCRA) regulations (40 Code of Federal Regulations [CFR], Section 261.[d]) specify that samples pf solid waste, water, soil or air, collected for the purpose of testing, are exempt from regulation when the following conditions apply:

   - Samples are being transported to a laboratory for analysis.
   - Samples are being transported from the laboratory to the collector after analysis.
   - Samples are being stored (1) by the collector prior to analysis; or (3) by the analytical laboratory after testing but prior to return sample to the collector or pending the conclusion of a court case.

2. The field sampling coordinator shall be responsible for the enactment and completion of the Chain-of-Custody records and the packaging and shipping requirements outlined as follows and in project-specific sampling plans. Samples must be:

   - Packaged so that they do not leak, break or vaporize. Waste samples should not be containerized with environmental samples to minimize chances of cross contamination.
   - Properly identified and each shipment or transfer must be accompanied by a Chain-of-Custody record.
   - Clearly labeled immediately upon collection. Each sample bottle should include the following information:
     - The project name and number.
     - A unique sample designation.
     - The date and time sample was collected.
     - Designation of the sample as a composite, if appropriate.
     - Identification of preservatives used.
     - Any remarks, as needed.
     - Sampler's name or initials.

3. After samples are collected, identified and preserved in the field, they are maintained under Chain-of-Custody procedures as described in Chapter 5.0.

4. When preparing a cooler for shipment, the samples should be inventoried and logged on the Chain-of-Custody form. As each sample bottle is logged on the Chain-of-Custody form, it should be wrapped with protective material (e.g. bubble wrap matting or plastic gridding) to prevent breakage. Each sample bottle should be packaged in an upright condition. All sample bottle caps should be checked during this time and tightened if needed. Additional packaging material, such as bubble wrap or Styrofoam pellets, should be spread throughout the voids between the sample bottles.

5. Most samples require refrigeration as a minimum preservative. Cold packs or ice placed in heavy-duty ziplock-type bags should be distributed over the top of the samples. Additional packaging materials should then be placed to fill the balance of the cooler or shipping container.

6. Place the complete Chain-of-Custody records in a ziplock-type plastic and place the bad on top of the contents within the cooler or shipping container. Retain a copy of the Chain-of-Custody record within the field records.

7. Close the top or lid of the cooler or shipping container and with another person rotate/shake the shipping container to verify that the contents are packed so that they do not move. Add additional packaging material if needed and re-close.

8. Place Chain-of-Custody type (signed and dated) at two different locations (front and back) on the cooler or shipping container lid and overlap with transparent packaging tape. Packaging tape should encircle each end of the cooler or shipping container at the hinges.

9. Sample shipment should occur via an overnight express service that can be guaranteed 24-hour delivery. Retain copies of all shipment records as provided by the shipper.

10. The documentation for support for proper packaging and shipment will include Chain-of-Custody records and shipper's records. All documentation will be retained in the project files.

4.5 DOCUMENTATION PROCEDURES

1. Color photographs and/or videos will be taken of representative sample locations and the surrounding site to show the area, sampling equipment and related site activities. Frame and roll number swill be logged on the appropriate field documentation form to identify photograph's with the correct sampling location. Examples of the field documents and forms are provided in the Workplan.

4.5.1 Daily Field Reports

1. A daily field activity log shall be used as a record of daily field activities showing the sequence of events. At a minimum, the log will include the following information:

- Project name and number.
- Date.
- Starting/ending time and the nature of each field activity.
- Names of all contractor personnel on the site, including visitors.
- Weather conditions.
- References to appropriate field logs for details of each activity performed (e.g., reference sample collection log for details of all samples collected that day).

- Identification of any photographs taken.
- A list of rented, leased, or subcontracted equipment.

4.5.2 Sample Collection Log

1. A sample collection log will be used as a record of field sampling activities and a at a minimum , the log will include the following:

   - Project name and number.
   - A unique sample identification.
   - The date and time sample was collected.
   - Designation of sample as a composite, if needed.
   - Identification of preservatives used.
   - Any remarks, as needed.
   - Sampler's name or initials.

4.5.3 Variance Log

1. Significant variances from the Workplan, QAPP, and the HSP shall be documented on a variance log. Variances affecting project scope and/or schedule mist be approved by the Project Coordinator. Any variance from the HSP must be approved by the Site Safety Officer (SSO). Copies of the variance log will be permanently maintained in the project file.

4.5.4 Document Maintenance

1. Field personnel are responsible for recording field activities on the appropriate field documentation form in sufficient detail to allow the event to be reconstructed without relying on memory. It is the responsibility of the field personnel to ensure that all documents are complete and legible. At the end of each day, all documents completed shall be reviewed by the Design Contractor for accuracy, completeness, and legibility.

2. The field documentation forms or records that shall be used during this investigation are listed below:

   - Sampling Information Form
   - Sample collection Log
   - Sample Chain-of-Custody Record
   - Daily Field Report
   - Weekly Field Report
   - Variance Log Form

3. Each completed form (a copy, or original depending on the type for form) will be maintained onsite in chronological order with other completed forms on the same type until the completion of the field activity. Copies of specific forms will be sent to the project office on a weekly basis for management purposes unless waved by

4. the Project Manger. Upon completion of the field investigation, all original field records and copies will be transferred to the Project Manager. File and working copies will be retained by the project office personnel for data evaluation and report preparation, as necessary.

4.5.5 Laboratory Results

1. The requested deliverables for Level III QA include the following:

- Case Narrative
- Sample Analysis Report
- Sample Cross Reference (if required)
- Chain-of-Custody Record
- Analysis Report:
  - Preparation and analysis run logs
  - Raw data and chromatograms
- Quality Control Summary:
  - Minimum detection limit summary
  - Initial calibration data
  - Detailed QA/QC data
  - Correction action reports

2. Table 4.2 provides a list of the various details QA/QC data required for each of the specific analyses.

4.6 DECONTAMINATION PROCEDURES

1. Pre-cleaned, stainless steel or brass sample sleeves will be used for the soil samples obtained form hand augers and hollow-stem augers. The sleeves will be pre-cleaned by immersing and scrubbing in a non-phosphate cleaner/water solution, followed by a tap water rinse and a distilled water rinse. The non-phosphate cleaner will be Simple Green, or an equivalent.

2. Augers (including hand augers and hydraulically-pushed sampler units) will be decontaminated prior to and between drilling at each borehole site by steam cleaning or high-pressure water cleaning. Split-spoon samplers will be disassembled during decontamination. The components will be decontaminated by immersion in a non-phosphate cleaning solution (Simple Green or an equivalent), and scrubbed by brushing, followed by rinsing with tap water and then by rinsing with distilled water.
3. Non-disposal sampling equipment (e.g., stainless steel bailer) will be decontaminated at the location where it was used.

4. The following is the general decontamination procedure for field equipment used in the subsurface investigation:

- Removal of soil and placement in drum.

- Washing and scrubbing with non-phosphate detergent
- Tap water rinse.
- Deionized/distilled water rinse.
- Isopropyl alcohol rinse.
- Deionized/distilled water rinse.
- Organic-free water rinse.
- Air dry.
- Wrapping in aluminum foil, shiny side out, for transport.

5.0 SAMPLE CHAIN-OF-CUSTODY

1. All samples or objects that are collected at the Centex Dayton Canyon site will be accompanied by a Chain-of-Custody form:

   - Project name and number.
   - Laboratory destination.
   - Name of sampler.
   - Airbill (courier) number.
   - The sample number, location and description, date and time collected, sample type, and container type.
   - Any special instructions and/or sample hazards.
   - Signature of sampler in the designated blocks, indicating his/her company, date, and time.
   - The condition of the sample upon receipt will be completed and recorded by the analytical laboratory.

2. The following Chain-of-Custody procedures will be followed for all samples submitted to the laboratory for chemical or physical properties analysis:

   - Each individual field sampler is responsible for the care and custody of samples he collects until the samples are properly transferred to the Design Contractor.
   - The Design Contractor is personally responsible for the care and custody of the samples received until they are properly transferred to the next authorized person or facility.
   - Sample labels will be completed for each sample using waterproof, indelible ink.
   - All samples collected must be documented on a sample collection log form.
   - A Chain-of-Custody form will be completed by the sampler for all samples or physical evidence collected.
   - Each time responsibility for custody of a sample changes, the new sample custodian will sign and date the Chain-of-Custody form, and note the date and time that the change occurred.
   - A copy of the Chain-of-Custody form shall be retained by the sampler.
   - The courier bill number corresponding to the air bill used to ship the cooler shall be recorded in the space provided at the top of the Chain-of-Custody form.
   - A copy of the courier airbill shall be retained as part of the final Chain-of-Custody documentation prepared by the laboratory.

- The laboratory manager will record the condition of the shipping container and sample containers upon receipt.
- The original Chain-of-Custody form will be returned from the laboratory as part of the final analytical report to the Project Coordinator. This record will be used to document sample custody transfer from the sampler to the laboratory and will become a permanent part of the project file.

6.0 CALIBRATION AND PREVENTATIVE MAINTENANCE

1. This section provides the requirements for control and maintenance of measuring and testing equipment and instruments used in the field sampling and monitoring. This program is designed to ensure that all field equipment and instrumentation is maintained and calibrated to operate within manufacturers' specifications and that the required traceability, sensitivity and precision of the equipment/instruments are maintained. Calibration requirements for offsite laboratory instruments are not addressed, since calibration is a requirement for reporting and validation of Level III data only. Measurements that affect the quality of an item or activity shall be taken only with instruments, tools, gauges or other measuring devices that are accurate, controlled, calibrated, adjusted and maintained at predetermined intervals to assure specified accuracy. Calibration and control measures are not required, for example, with rulers, tape measures, levels and other such devices when normal commercial equipment provides adequate accuracy.

6.1 CALIBRATION

1. Measuring and testing equipment shall be calibrated against certified equipment having known valid relationships to nationally-recognized standards and shall be calibrated, adjusted, and maintained at prescribed intervals or prior to use. Documented procedures shall be used for calibrating or performing field checks on equipment. Whenever possible, widely accepted procedures such as those published by the American National Standards Institute (ANSI), ASTM, or procedures provided by the manufacturers, shall be adopted. Field check procedures shall be used to perform checks prior to use in between formal calibrations.

2. Calibration and maintenance of field equipment and instrumentation shall be in accordance with manufacturers' specifications or applicable test specifications, and shall be documented. The method and interval of calibration for each item shall be defined based on the type of equipment, stability characteristics, required accuracy, intended use, and other conditions that affect measurement control. When measuring and testing, if equipment is found to be out of calibration, an evaluation shall be made and documented of the validity of previous results obtained. Devices that are out of calibration shall be tagged and segregated, and shall not be used until they have been recalibrated. If equipment is found consistently to be out of calibration, it shall be replaced or repaired. A calibration shall also be performed when the accuracy is suspect.

3. Equipment shall be handled and stored properly to maintain accuracy.

6.2 PREVENTATIVE MAINTENEANCE

1. Preventative maintenance programs shall, at a minimum, be established for equipment and systems that would otherwise be subject to breakdown, when that breakdown could lead to safety hazards, environmental contamination or loss of completeness and accuracy in data. At a minimum, the maintenance frequency and program will comply with the manufacturer's recommended requirements. At a minimum, the instrumentation preventative maintenance program will consist of the following activities, which will be performed at the indicated frequencies:

   - Instrument inspection (daily).
   - Instrument cleaning and adjustment (weekly or more frequently, as needed).
   - Replacement of filters or other adsorption devices (as recommended by the manufacturer or as indicated by performance).
   - Battery charging (daily or more frequently, as needed).
   - Battery replacement (as necessary).

2. A list of critical spare parts is not required due to the reliability of the equipment. However, the supplier will maintain a set of replacement equipment which can be shipped to the site within 24 hours.

6.3 RECORDS

1. Records shall be maintained as evidence of required calibration frequencies, and equipment shall be marked suitably to indicate calibration status. If marking on the equipment is not possible, records traceable to the equipment will be retained in accordance with Section 4.5 and be readily available for reference.

7.0 ANALYTICAL PROCEDURES

1. The analytical procedures to be used for the PEA Workplan are listed in Table 4.1, and include the required containers, preservatives and holding times.

8.0 DATA REDUCTION, VERIFICATION, VALIDATION AND REPORTING

1. All raw data collected from project sampling tasks and used in project reports will be appropriately identified and included in a separate appendix within the Final RD Workplan. Data collected during the field activities will be validated by checking the procedures used and comparing the data to previous measurements. Field QC samples will be evaluated to ensure that field measurements and sampling protocols have been observed and followed. These checks will include:

   - Use of standard operating procedures.

- Calibration method and frequency.
- QC lot number.
- Date and time stamped.
- Preservation.
- Samplers.
- Laboratory.
- Chain-of-Custody forms.
- Date shipped.
- Airbill number.

2. Validation of data obtained from portable field monitoring equipment will be performed by the Design Team. Validity of all data will be determined by checking calibration procedures utilized in the field, and by comparing the data to previous measurements obtained, if any. Large variations (greater than 10 percent) will be examined for possible recollection of data or assigned a data qualifier using standard EPA methodology.

8.1 DATA REDUCTION

1. The data reduction aspect is to format the data into a usable medium. Data will be entered on the computer by Allwest personnel. Ease of retrieval, accountability of all data, generation of summary tables and graphs are all important aspects of the database program.

8.2 DATA VERIFICATION

1. The verification program is primarily designed to ensure that documentation and data are reported in compliance with the established requirements, and that all requested analyses are performed. The data verification program consists of the following: (1) data delivery tracking and analytical costing; and (2) review of sample identification information, signed Chain-of-Custody forms, analytical holding times, requested turnaround time, and data review information.

2. Delivery of analytical data will be tracked to ensure that the requested laboratory services are performed in an accurate and timely manner. Data is logged manually on the Chain-of-Custody form. After receiving the data reports, they are to be reviewed to determine if all contractual format requirements have been met and to confirm that the requested data parameters are received. Analytical data will be reviewed by the contractor's technical personnel familiar with the monitoring program and the investigation. Sample data is also to be compared with the QA/QC samples collected on the same sample lot. The data review is used to report inconsistencies in concentrations, sampling procedures, and sample identification.

8.3 DATA VALIDATION

1. Data validation is the process of reviewing laboratory records of analytical data and quality-related field data to assess laboratory performance as compared to QC

criteria, and data quality and procedural requirements. The purpose of validation is to document the quality and usefulness of the data and the documentation developed during the sample analysis. Data validation is divided into the following tasks: (1) identification of data to be validated; (2) technical review; and (3) documentation of the validation effort.

2. Calculations that interpret and analyze data shall be performed in a planned, controlled and documented manner. Calculation documentation for interpretation and analysis shall include purpose, method, assumptions, inputs, references and units, such that a technically-qualified person may review, understand, verify and duplicate the calculations without recourse to the originator. Calculations shall be identifiable by subject, originator, reviewer and date. Calculation documentation shall include the following:

   - Definition of the objective of the interpretation/analysis.
   - Definition of inputs and their sources.
   - List of applicable references.
   - Results of literature searches or other background data.
   - Identification of assumptions.
   - Identification of any computer calculations, including computer type, program name, revision, input, output, evidence of program verification, and the basis of application to the specific problem.
   - Signature and dates of the review and approval by the appropriate qualified personnel.

3. The first level of review and consequent data reduction, validation, and reporting is done at the laboratory. Data reduction, validation and reporting at the laboratory will be implemented in accordance with standard EPA methods for analytical and QA protocols. In general, the laboratory reviews will be performed by the laboratory analyst, the QA.QC Manager, and laboratory management.

4. The second level of data review is conducted outside the laboratory. Data review will be performed by Allwest Remediation, Inc. The data will be reviewed by staff chemists who are not assigned to the laboratory. The staff chemists will follow the Sample Management Office (SMO) guidelines as described in the EPA Technical Directive Document (EPA No. HQ8410-01, Contract No. 68-01-6699).

5. For non-Routine Analysis Service measurements (RAS), the data validation, reduction and reporting will be done at the laboratory level. The data reviewers include analysts, the QA/QC Manager and management. The data are reduced and validated by the laboratory in accordance with individual analytical methodologies, quality control procedures, and the use of appropriate standards and correct transcriptions. Data will be reviewed outside the laboratory for project usability. The review will include the following:

   - Instrument calibrations
   - Standards

- Analytical methodology
- Detection of limits
- Blanks for contamination
- Accuracy and precision
- Data reduction, validation and reporting

6. Where the data does not meet the quality control requirements specified in this document for the items indicated above, the data will be flagged with qualifiers. Common used qualifiers include:

- J - Estimated, usable for limited purposes. The data are qualitatively, but not quantitatively, unacceptable.
- R - Rejected, unusable. The data are qualitatively and quantitatively unacceptable.
- U - Undetected. The result is undetected at the method detection limit.
- [] - The result is between the Instrument Detection Limit (IDL) and the contract required detection level (CRDL) and is subject to inaccuracies common to the lower end of the instrument's linearity.
- No qualifier - Data are acceptable.

7. Field data validation will be based on field logbooks and field audits with regard to proper calibration and procedures as summarized in Chapter 10.0. Field data will be validated by the field contractor and project manager.

8. Data assessment will follow the in-depth data review and validation procedures. Data accuracy, precision, and completeness values will be summarized according to control limits specified in the QAPP. The following section describes the quantitative definition of accuracy, precision and completeness.

9. Accuracy is calculated based on spiked samples. The recovery ® can be defined as a measure of accuracy where:

- c1 = Measured concentration analyzed in the sample after adding the spike, mg/L.
- co = Measured concentration analyzed in the sample without the addition of a spike, mg/L.
- cs = Concentration of standard added to the sample, mg/L.
- vs = Volume of standard added to the sample, 1.
- r = (c1 – co)/(cs x vs x 10-3) or on a percentage basis.
- % = (c1 – co) 100/(cs x vs x 10-3)

10. The primary measurement of data precision will be the RPD between a duplicate pair of data points:

$$\text{Percent RPD} = \frac{X_2 - X_1}{(X_1 + X_2)/2} \times 100$$

where:

- X_1 = First duplicate point value
- X_2 = Second duplicate point value

11. Measurement completeness (C) is the ratio of acceptable measurements obtained to the total number of planned measurements for an activity. This is defined as:

$$C = 1 - \frac{\text{number of defective items}}{\text{total number of items}} \times 100$$

8.4 DATA REPORTING

1. Data resultant from this sampling effort will be presented in a report on a computer disk which will be sent to the Project Manager. The report will consist of a presentation of the raw analytical data, and summaries of the validation and verification efforts, as well as interpretive efforts relative to the data.

9.0 INTERNAL QUALITY CONTROL CHECKS

9.1 QUALITY CONTROL CHECKS

1. The evaluation of data will involve the collection of QC samples in accordance with the Workplan and this QAPP. QC procedures for measurements not involving the collection of samples are limited to checking the reproducibility of the measurement in the field by obtaining multiple readings.

2. Following are descriptions of QC checks which will be implemented for this study. Field QC sampling will be established to check the sampling's analytical accuracy and precision. All QC samples will be shipped as described in Chapter 4.0 of this QAPP. Field QC samples will have unique sample designators, assigned in the same manner as non-QC samples, and will be submitted as "blind" to the laboratories. These samples will be analyzed as if they were original field samples. Results of these samples will be included in the analytical report. Data quality objectives for the various analyses are provided in Table 4.2. Specific quantitation limits for EPA Method 8240b are shown in Table 9.1. Quantitative limits for EPA Method 6010b/7471a are shown in Table 9.2.

3. The internal QC measures relative to the analytical work are to be conducted as specified in the methodology used for the analysis. Generally, the laboratory QC measurements include, but are not limited to:

- Initial and continuing calibration checks.
- Surrogate standards for volatile organic analysis.
- Matrix, analytical spikes and spike duplicates.
- Laboratory-generated duplicates and blanks.

9.2 QUALITY CONTROL SAMPLING

1. Specific field quality control sampling types and frequencies are shown in Table 9.3.

10.0 AUDITS AND QUALITY ASSURANCE OVERSIGHT

1. This section provides requirements for the planning, scheduling, and conducting of QA audits and oversight activities to verify that site activities are being performed efficiently in conformance with approved plans, standards, federal and state regulatory requirements, sound scientific practices, and contact requirements. Planned and scheduled audits shall be performed to verify compliance with aspects of the QAPP and to determine its effectiveness. Audits shall include an objective examination of work areas, activities, processes, review of documentation and records, interviews with project personnel, and review of plans and standards.

2. Audits should be scheduled and conducted as early in the life of an activity or the project as possible. They should be scheduled at intervals consistent with the complexity and importance of the activity. In the case of laboratory testing, an evaluation should be conducted to determine that the laboratory is qualified to perform the work before the testing activity is started. Audits shall be performed in accordance with written checklists and conducted by a qualified QA Audit Team Leader. Appropriately trained personnel not having direct responsibilities in the areas being audited may be used, at the discretion of the QA Team Leader, to enhance the effectiveness of the audit.

3. Audit reports shall be issued for action to the management responsible for the activity being audited. Follow-up verification action, including re-audit of deficient areas, shall be accomplished as soon as practical.

10.1 PERFORMANCE OF AUDITS

1. QA audits shall be performed to:

- Determine that an effective QA program has been implemented.
- Verify (by direct examination of objective evidence) whether QA program elements conform to specified requirements.
- Verify ongoing activities by actual observations.
- Assess the effectiveness of controls.
- Report audit finds to deficiencies to the applicable levels of management who are responsible for taking corrective action.
- Verify that corrective action has been planned, initiated, and completed.
- Address technical considerations that verify the quality of the items or data, service, and activities, as well as programmatic compliance.

10.2 PREPARATION OF AUDITS

10.2.1 Audit Plan

1. The auditor shall develop and document an audit plan for each audit which identifies the audit scope, applicable requirements, audit personnel, activities to be audited, organizations to be notified and the schedule.

10.2.2 Audit Personnel

1. The Project Manager or designee will organize and direct the audit, coordinate the preparation and issuance of the audit report, and evaluate responses.

10.2.3 Audit Preparation

1. Audit preparation will include review of pertinent background information about the project and any associated technical documents. Audit preparation also includes a review of any past audit results to determine the nature of problems that have occurred and that appropriate corrective actions have been completed.

10.3 AUDIT PERFORMANCE

10.3.1 Pre-Audit Conference

1. A pre-audit conference will be conducted with the PAB Site Project Manager and representatives of project participants (such as subcontractors and laboratories). The purpose of the conference is to:

    - Confirm the audit scope and planned dates.
    - Meet counterparts.
    - Discuss the sequence and duration of the audit.
    - Set the time for the post-audit conference.
    - Establish channels of communication.

10.3.2 Audit Performance

1. Activities that have been selected for audit will be evaluated against specified requirements which will include a review of the methods, procedures, and instructions. Documents and records will be examined as necessary to determine if the QA program is effective and properly implemented. Documents to be examined include laboratory reports and QA/QC documents, field log books, and calibration logs. Data will be examined against DQOs identified in section 3.1. Significant violations shall be immediately reported to the Project Manager.

10.3.3 Post-Audit Conference

1. At the conclusion of the audit, a post-audit conference shall be held with management to present audit results and clarify or resolve outstanding questions and/or concerns.

10.4 REPORTING

1. The final audit report will be signed and issued by the Project Manager and will include the following information, as appropriate:

   - A description of the audit scope.
   - Identification of the auditors.
   - Identification of persons contacted during audit activities.
   - A summary of audit results, including a statement on the effectiveness of the QA program elements which were audited.
   - A description of each reported adverse findings in sufficient detail to enable corrective action to be taken by the audited organization.

2. Audit findings of a common nature shall be grouped in the audit report whenever possible so the related or systematic breakdowns in the quality programs are identified. Findings shall be categorized based on their degree of safety or environmental significance. The audit report shall be issued within 30 days, and include a required date for a response by the audited organization, when a response is necessary. This will usually be 15 days from the receipt of the audit report. The audit report will be distributed to Centex management.

10.5 AUDIT RESPONSE

1. Management of the audited organization or activity shall investigate adverse audit findings, determine root causes, schedule corrective actions, including provisions to prevent recurrence, and respond to the report in writing. The response shall not be submitted later than the required due date, unless an extension has been agreed upon between the Project managers and the audited organization. In the event that corrective action cannot be immediately taken, the response shall include a scheduled date for initiation and completion. The adequacy of audit responses shall be evaluated by the Project Coordinator and Project Manager upon receipt. If the response is inadequate, the Project Coordinator or designee will contact the audited organization and request additional action. The audited organization shall report periodically on the basis of corrective action taken, until complete.

10.6 FOLLOW-UP ACTION

1. Follow-up action shall be taken by the management of the audited organization and the Project Coordinator or designee to verify:

   - A timely, written response to the audit report has been prepared.

- The adequacy of the response.
- That corrective action has been accomplished, as scheduled.

10.7 AUDIT CLOSE-OUT

1. Audits will be closed when all corrective action has been completed, verified and documented. Audit records shall include audit plans, audit reports, written responses and closure records which will be forwarded to the QA/QC manager for filing upon completion of the audit package.

10.8 QUALITY ASSURANCE OVERSIGHT

1. QA oversight will be performed using performance-based concepts for monitoring and observing activities, and to verify conformance to the RD Work plan, SAP and QAPP requirements. QA oversight is an ongoing activity of the field activities and laboratory work and shall be performed by the QA/QC Manager.

2. Daily field monitoring shall include the following, at a minimum:

   - Activity.
   - Date.
   - Description of results, including acceptable results or any violations, and potential quality problems identified.
   - Identification of the organization, activities or items observed, including the name(s) of personnel contacted.
   - Name of individuals or organizations responsible for corrective actions, as applicable.
   - Designated due date for the corrective action response.

3. Monitoring of the laboratory will include evaluation of:

   - Results.
   - Compliance with QA/QC requirements.
   - Reports and documentation for compliance with requirements.

3. Daily reports shall be submitted to the Project Manager. Nonconformance identified shall be reported in accordance with Chapter 12.0, Nonconformance Control and Corrective Action, and will be accomplished in accordance with that section.

11.0 DATA ASSESSMENT

1. This section provides requirement for the interpretation, analysis and evaluation of the data obtained during sampling operations.

11.1 DATA INTERPREATION AND ANALYSIS

1. The activities involved with data interpretation and analysis include summarizing and presenting the data in both tabular and graphical forms. The data collected will be added to the existing analytical database created for the study for ease of comparative purposed, and generating tabular summaries and graphical output. Data which is qualified during validation may be used for qualitative decision-making, based on the judgment of the Project Manager. The uses of certain statistical analyses which may be used include the use of means, standard deviation, EPA outlier detection methods, and analysis of variance calculations (ANOVA).

12.0 NONCONFORMANCE CONTROL AND CORRECTIVE ACTION

1. This section establishes the requirements for identifying, reporting, controlling and dispositioning nonconformance's; and provides the requirement to assure action is taken to correct conditions that have an adverse effect on quality and to preclude conditions that have a significant adverse effect on quality. Nonconforming items, data and activities are those that do not meet project requirements, contract criteria or approved methods. Items that do not conform to specified requirements shall be controlled to prevent inadvertent installation or use. Controls shall provide for identification, documentation, evaluation and segregation (when practical) of such items. Design Contractors of affected work activities will be notified and the nonconformance dispositioned.

12.1 IDENTIFICATION OF NONCONFORMANCES

1. Nonconformance may be identified by any of the methods listed below:

   - QA audits.
   - QA oversight.
   - Data validation reviews.
   - Other review activities.

2. Nonconformance can be identified by any project personnel. Once a nonconformance has been identified, it should be brought to the attention of the QA/QC Manager so the nonconforming condition can be properly documented on a Nonconformance Report (NCR) and dispositioned.

12.2 EVALUATION AND DISPOSITION OF NONCONFORMANCES

1. Once a nonconforming condition has been documented, it is evaluated, dispositioned, and corrective actions are established. Once correction actions have been completed, the QA/QC Manager will verify all actions were performed and documented. The NCR will be closed once these corrective actions are deemed adequate by the QA/QC Manager.

12.3 CORRECTIVE ACTION

1. Once a corrective action program has been established, it shall be implemented to ensure that conditions adverse to quality are identified promptly and corrected as soon as practical. In the case of a significant adverse to quality, the root of the condition shall be determined and corrective action taken to preclude recurrence. The identification, root cause and corrective action for significant conditions adverse to quality shall be documented and reported to appropriate levels of management. Follow-up shall be taken to verify implementation of this corrective action.

12.4 REPORTING AND RESOLUTION OF QUALITY PROBLEMS

1. Significant quality problems and conditions which adversely affect quality shall be identified, reported, and corrected in accordance with the following requirements:

- Specific criteria shall be developed for identifying significant quality problems and adverse conditions.
- Management information, including lessons learned form significant quality problems and adverse conditions shall be routinely disseminated to all affected organizations.
- Existing, discovering or potentially out-of-control quality conditions shall be promptly reported to responsible management for evaluation and action.
- Upon discovering or receiving notification that a significant quality problem or adverse condition exists, the following action shall be taken:
    1. Take timely actions to remedy the specific condition.
    2. Determine the root cause factors.
    3. Take appropriate action to preclude recurrence, including review, evaluation and revision of controls, if necessary.
    4. Assess and document the impact on completed work.

12.5 RECURRING CONDITIONS ADVERSE TO QUALITY

1. For recurring problems where corrective actions have been effective, management, as needed, shall:

- Determine the events leading to the occurrence of the quality problems.
- Develop an understanding of the technical and work activities associated with the quality problems.
- Ascertain the quality problems generic implications.
- Determine the extent to which similar quality problems (or precursors to the problems) have been recognized by the responsible organization, the effectiveness of any generic implications, and impacts on completed work.
- Consider stopping work associated with the applicable activity.
- Recommend actions that can be taken by the responsible organization to preclude recurrence.

2. The QA/QC Manager is authorized to stop work until an unsatisfactory condition has been corrected. The QA/QC manager is responsible for verifying that the unsatisfactory condition has been resolved and for authorizing work resumptions.

13.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

1. The QA/QC manager or his designee shall review aspects of the implementation of the program on a monthly basis and submit a summary report to the Project Manager. These reviews shall include an assessment of the data quality assessment activities, the results of audits and oversight (as appropriate), and an assessment of the status of nonconformances and corrective actions.

13.1 REPORTING SIGNIFICANT NONCONFORMANCES OR QUALITY PROBLEMS

1. Significant nonconformances or quality problems shall be reported to the Project Manager for evaluation and possible management action. Examples of significant nonconformances or quality problems include the following:

- Failure of an organization to establish and implement appropriate QA and technical requirements, plans and procedures.
- Continuing or repetitive program inadequacies, deviations or noncompliances and the failure of appropriate organizations to provide proper direction, overview or correction.
- Failure of project organizations to take reasonably prompt and effective actions to correct deficiencies.